WE CLAIM:

1. An energy meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a sensor coupled with said electric circuit and operative to sense the voltage in said electric circuit and generate an analog signal indicative of said voltage;

an analog to digital converter coupled with said sensor and operative to convert said analog signal to one or more digital samples;

a memory coupled with said analog to digital converter and operative to receive and store said digital samples; and

a detector coupled with said memory and operative to compute a plurality of rolling voltages from said stored digital samples over an interval and to compare each of said plurality of rolling voltages to a threshold and indicate a sag/swell event when said rolling voltage deviates from said threshold.

2. The energy meter of Claim 1 wherein said interval is at least the difference in time between subsequent of said one or more digital samples.

3. The energy meter of Claim 1 wherein said analog to digital converter converts said analog signal to said digital samples at a rate of at least 16 samples per cycle.

4. The energy meter of Claim 1 wherein said detector comprises a digital signal processor.

5. The energy meter of Claim 1 wherein said detector is further operative to calculate and record the amount by which said rolling voltage deviates from said threshold.

6. The energy meter of Claim 5 wherein said detector is further operative to calculate and record the maximum amount by which said rolling voltage deviates from said threshold for successive increments of time.

7. The energy meter of Claim 1 wherein said detector is further operative to calculate and record the duration for which said rolling voltage deviates from said threshold.

8. The energy meter of Claim 1 wherein said threshold is computed dynamically.

9. The energy meter of Claim 8 wherein said computation is based on the nominal voltage and the meter scaling.

10. The energy meter of Claim 1 wherein said detector is further operative to trigger a waveform recorder when said rolling voltage deviates from said threshold.

11. The energy meter of Claim 1 wherein said detector is further operative to suppress indication of a transient when a sag/swell event is concurrently indicated.

12. The energy meter of Claim 1 further comprising:

bayonet terminals disposed on said meter mateable with matching jaws of a detachable meter mounting device; and

a seal connected between said meter and said detachable meter mounting device, said seal operative to prevent removal of said meter and indicate tampering with said meter.

13. The energy meter of Claim 1 further comprising:

a display;

terminals disposed on a bottom side of said meter for coupling said meter with said electric circuit;

a meter cover operative to enclose said meter and said display;

a terminal cover for covering said terminals;

a first seal connected with said meter cover and operative to prevent removal of said meter cover; and

a second seal connected with said terminal cover and operative to prevent removal of said terminal cover.

14. The energy meter of Claim 1 wherein said rolling voltage is computed at least 2 times per cycle.

15. The energy meter of Claim 1 wherein said rolling voltage is computed each time a new voltage sample is taken.

16. The energy meter of Claim 15 wherein said detector computes the most recent of said one or more digital samples into said rolling voltage and computes the oldest of said one or more digital samples out of said rolling voltage.

17. An energy meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said enclosure;

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter;

a sensor coupled with said electric circuit and operative to sense the voltage in said electric circuit and generate an analog signal indicative of said voltage;

an analog to digital converter coupled with said sensor and operative to convert said analog signal to one or more digital samples;

a memory coupled with said analog to digital converter and operative to receive and store said digital samples; and

a detector coupled with said memory and operative to compute a plurality of rolling voltages from said stored digital samples over an interval and to compare each of said plurality of rolling voltages to a threshold and indicate a sag/swell event when said rolling voltage deviates from said threshold.

18. In an energy meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, a method for detecting sag/swell events comprising:

sensing the voltage in said electric circuit and producing an analog signal indicative thereof;

converting said analog signal to a plurality of digital samples;

computing a rolling voltage from said plurality of digital samples each time a new digital sample is converted;

comparing said rolling voltage to a threshold value;

indicating a swell event when said rolling voltage exceeds said threshold value; and

indicating a sag event when said rolling voltage is less than said threshold.

19. The method of Claim 18 wherein said converting is executed at least 16 times per cycle.

20. The method of Claim 18 wherein said computing is executed at least 2 times per cycle.

21. The method of Claim 18 wherein said computing further comprises:

factoring in the most recent of said plurality of digital samples into said rolling voltage computation; and

factoring out the oldest of said plurality of digital samples out of said rolling voltage computation.

22. An energy meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a sensor coupled with said electric circuit and operative to sense a power parameter in said electric circuit and generate an analog signal indicative of said power parameter;

an analog to digital converter coupled with said sensor and operative to convert said analog signal to one or more digital samples;

a first memory coupled with said analog to digital converter and operative to receive and store said one or more digital samples;

a first processor coupled with said analog to digital converter and further coupled with said first memory by a first data bus;

a second processor coupled with a second memory by a second data bus;

a bus arbiter responsive to said first and second processors and coupled with said first and second data busses, said bus arbiter operative to isolate said first data bus from said second data bus under normal operating conditions; and

said bus arbiter further operative to couple said first data bus to said second data bus and perform a data transfer between said first memory and said second memory.

23. The energy meter of Claim 22 further comprising:

bayonet terminals disposed on said meter mateable with matching jaws of a detachable meter mounting device; and

a seal connected between said meter and said detachable meter mounting device, said seal operative to prevent removal of said meter and indicate tampering with said meter.

24. The energy meter of Claim 22 further comprising:

a display;

terminals disposed on a bottom side of said meter for coupling said meter with said electric circuit;

a meter cover operative to enclose said meter and said display;

a terminal cover for covering said terminals;

a first seal connected with said meter cover and operative to prevent removal of said meter cover;

a second seal connected with said terminal cover and operative to prevent removal of said terminal cover.

25. The energy meter of Claim 22 further comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said

enclosure; and

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter.

26. The energy meter of Claim 22 wherein said power parameter is a parameter selected from the group consisting of voltage and current.

27. The energy meter of Claim 22 wherein said analog to digital converter converts said analog signal to said one or more digital samples at a rate of at least 64 samples per cycle.

28. The energy meter of Claim 27 wherein said second memory is capable of storing at least 12 cycles of digital samples.

29. The energy meter of Claim 22 wherein said analog to digital converter converts said analog signal to said one or more digital samples at a rate of at least 64 samples per cycle.

30. The energy meter of Claim 29 wherein said second memory is capable of storing at least 12 cycles of digital samples.

31. A revenue meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said enclosure;

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter;

a first sensor coupled with said electric circuit and operative to sense the

voltage in said electric circuit and generate a first analog signal indicative of said voltage;

a second sensor coupled with said electric circuit and operative to sense the current in said electric circuit and generate a second analog signal indicative of said current;

an analog to digital converter coupled with said first and second sensors and operative to convert said first and second analog signals to one or more digital samples;

a memory coupled with said analog to digital converter and operative to receive and store said digital samples; and

a calculator coupled with said memory and operative to compute one or more harmonic frequencies of said voltage and said current from said stored digital samples.

32. The revenue meter of Claim 31 wherein said analog to digital converter converts said first and second analog signals at a rate of at least 64 samples per cycle.

33. The revenue meter of Claim 31 wherein said memory stores at least 1 cycle of digital samples.

34. The revenue meter of Claim 31, said voltage in said electric circuit having a fundamental frequency, wherein said analog to digital converter converts said first and second analog signals to said one or more digital samples at a rate synchronous to said fundamental frequency.

35. The revenue meter of Claim 31 wherein said calculator comprises a Fourier Transform.

36. The revenue meter of Claim 31 wherein said calculator is capable of calculating the magnitude of said harmonic frequencies up to at least the 31st harmonic.

37. The revenue meter of Claim 36 wherein said calculator is further operative to record said harmonic frequencies.

38. The revenue meter of Claim 31 wherein said calculator is further operative to compute the magnitude and phase angle of said harmonic frequencies.

39. The revenue meter of Claim 38 further comprising a graphical display wherein said meter is capable of displaying said magnitude and said phase angle of said harmonic frequencies on said display in a graphical format.

40. The revenue meter of Claim 38 further comprising a graphical display wherein said meter is capable of displaying said magnitude and said phase angle of said harmonic frequencies on said display in a numeric format.

41. The revenue meter of Claim 38 further comprising a detector coupled with said harmonic calculator and operative to compare said magnitude to a threshold and indicate when said magnitude exceeds said threshold.

42. The revenue meter of Claim 41 wherein said detector is further operative to trigger a waveform recorder when said magnitude exceeds said threshold.

43. A revenue meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said electric circuit comprising at least one phase, said meter comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said enclosure;

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter;

one or more voltage sensors coupled with each of said at least one phase of said electric circuit and operative to sense the voltage in each of said at least one phase and generate an analog signal indicative of said voltage;

one or more current sensors coupled with each of said at least one phase of said electric circuit and operative to sense the current in each of said at least one phase and generate an analog signal indicative of said current;

at least one analog to digital converter coupled with said one or more voltage sensors and said one or more current sensors and operative to convert said analog signals to one or more digital samples at a rate of at least 64 samples per cycle;

a memory coupled with said analog to digital converter and operative to receive and store said one or more digital samples; and

a processor coupled with said memory and operative to compute one or more fundamental voltage vectors from the magnitude and phase angle of the fundamental frequency of each of said voltage and said current and further operative to compute the zero, positive and negative sequence voltages by performing a vector addition of said one or more fundamental voltage vectors.

44. The revenue meter of Claim 43 wherein said memory stores at least 1 cycle of digital samples.

45. The revenue meter of Claim 43 wherein said processor comprises a Fourier Transform.

46. The revenue meter of Claim 43 wherein said processor is further operative to compute the zero, positive and negative sequence currents.

47. The revenue meter of Claim 43 further comprising a graphical display wherein said meter is capable of displaying said one or more fundamental voltage vectors.

48. The revenue meter of Claim 43 further comprising a symmetrical component detector coupled with said processor and operative to compare said zero, positive and negative sequence voltages to a threshold and indicate when said voltages exceed said threshold.

49. The revenue meter of Claim 48 wherein said symmetrical component detector is further operative to trigger a waveform recorder when said voltages exceed said threshold.

50. In a revenue meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said electric circuit comprising at least one phase, a method of computing symmetrical components comprising:

providing a switchboard revenue meter including a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure, terminals disposed on said chassis for engaging matching terminals within said enclosure, a display, a meter cover operative to enclose said meter and said display within said enclosure and a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter;

sensing the voltages in each of said at least one phase and generating analog signals indicative thereof;

converting said analog signals to one or more digital samples at a rate of at least 64 samples per cycle;

storing said digital samples in a memory;

computing one or more fundamental voltage vectors from the magnitude and angle of the fundamental frequency of each of the sensed voltages from said stored digital samples; and

performing a vector addition of said one or more fundamental voltage vectors to compute the zero sequence voltage.

51. The method of Claim 50 wherein storing further comprises storing at least one cycle of digital samples.

52. The method of Claim 50 wherein said computing further comprises performing a Fourier Transform on said stored digital samples.

53. The method of Claim 50 further comprising:

shifting a first of said one or more fundamental voltage vectors by plus 120

degrees from a first starting point;

shifting a second of said one or more fundamental voltage vectors by minus 120 degrees from a second starting point;

performing a vector addition of said first, said second and remaining fundamental voltage vectors;

computing the positive voltage sequence;

shifting said first of said one more fundamental voltage vectors by minus 120 degrees from said first starting point;

shifting said second of said one or more fundamental voltage vectors by plus 120 degrees from said second starting point;

performing a vector addition of said first, said second and remaining fundamental voltage vectors; and

computing the negative voltage sequence.

54. The method of Claim 53 further comprising displaying said one or more fundamental voltage vectors.

55. The method of Claim 53 further comprising:

comparing said zero, positive and negative sequence voltages to a threshold; and

indicating when said voltages exceed said threshold.

56. The method of Claim 55 further comprising triggering a waveform recorder when said voltages exceed said threshold.

57. The method of Claim 50 further comprising:

sensing the currents in each of said at least one phase and generating analog signals indicative thereof;

converting said analog signals to one or more digital samples;

storing said digital samples in a memory;

computing one or more fundamental current vectors from the magnitude and angle of the fundamental frequency of each of the sensed currents from said

stored digital samples;

performing a vector addition of said one or more fundamental current vectors; and

computing the zero sequence current.

58. The method of Claim 57 further comprising:

shifting a first of said one or more fundamental current vectors by plus 120 degrees from a first starting point;

shifting a second of said one or more fundamental current vectors by minus 120 degrees from second starting point;

performing a vector addition of said first, said second and remaining fundamental current vectors;

computing the positive current sequence;

shifting said first of said one more fundamental current vectors by minus 120 degrees from said first starting point;

shifting said second of said one or more fundamental current vectors by plus 120 degrees from said second starting point;

performing a vector addition of said first, said second and remaining fundamental current vectors; and

computing the negative current sequence.

59. The method of Claim 58 further comprising displaying said one or more fundamental current vectors.

60. The method of Claim 58 further comprising:

comparing said zero, positive and negative sequence currents to a threshold; and

indicating when said currents exceed said threshold.

61. The method of Claim 60 further comprising triggering a waveform recorder when said currents exceed said threshold.

62. A revenue meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said enclosure;

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter;

a sensor coupled with said electric circuit and operative to sense a power parameter in said electric circuit and generate an analog signal indicative of said power parameter;

an analog to digital converter coupled with said sensor and operative to convert said analog signal to one or more digital samples at a rate of at least 64 samples per cycle;

a first memory coupled with said analog to digital converter and operative to receive and store said one or more digital samples;

a second memory coupled with said first memory;

a power quality event detector coupled with said analog to digital converter and operative to detect a power quality event and generate a trigger signal;

a holdoff timer coupled with said detector and operative to receive, delay and re-transmit said trigger signal; and

a memory preservation mechanism coupled with said first memory, said second memory and said holdoff timer and operative to preserve the contents of said first memory using said second memory upon receipt of said trigger signal from said holdoff timer.

63. The revenue meter of Claim 62 wherein said power parameter is a parameter selected from the group consisting of voltage and current.

64. The revenue meter of Claim 62 wherein said memory stores at least 1 cycle of digital samples.

65. The revenue meter of Claim 62 wherein said power quality event includes events selected from group consisting of transient, sag, swell, wave shape deviation, harmonic deviation and component symmetry deviation.

66. The revenue meter of Claim 62 wherein said memory transfer mechanism is further operative to only transfer a user programmable subset of the contents of said first memory to said second memory.

67. The revenue meter of Claim 62 wherein said first and second memories have a user programmable capacity.

68. The revenue meter of Claim 62 further comprising communications means for communicating the contents of said second memory to a remote location.

69. The revenue meter of Claim 68 wherein said communications means comprise a modem.

70. The revenue meter of Claim 68 wherein said communications means comprise a communications network interface.

71. A revenue meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said enclosure;

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter;

a first power supply coupled with said electric circuit and operative to provide power to said meter from said electric circuit under normal operating conditions; and

a second power supply operative to provide power to said meter when a power quality event occurs on said electric circuit, said second power supply including:

at least one first capacitor coupled with said electric circuit and operative to store electrical energy from said electric circuit; and

at least one second capacitor coupled with said at least one first capacitor and said meter and operative to store electrical energy from said electric circuit;

said first and second capacitors further operative to provide said energy to said meter when said power quality event occurs.

72. The revenue meter of Claim 71 wherein said at least one second capacitor has a higher capacitance than said at least one first capacitor.

73. A revenue meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said enclosure;

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter;

a switching regulator coupled with said electric circuit and said meter and operative to convert said high voltage electrical energy to low voltage electrical energy; and

a power supply coupled between said electric circuit and said switching regulator and operative to store said high voltage electrical energy and provide power to said meter when a power quality event occurs on said electric circuit.

74. The revenue meter of Claim 73 wherein said power supply comprises at least one capacitor.

75. A revenue meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said enclosure;

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter; and

a power supply coupled with said electric circuit and said meter and operative to store energy from said electric circuit and provide said energy to said meter when a power quality event occurs on said electric circuit, said power supply including:

a high voltage portion coupled with said electric circuit and a low voltage portion coupled with said high voltage portion and said meter; and

a processor coupled with said high voltage portion and operative to monitor said power supply and signal said meter when said stored power runs low.

76. The revenue meter of Claim 75 wherein said power supply comprises at least one capacitor.

77. A revenue meter for measuring the delivery of electrical energy from an energy supplier to a consumer through an electric circuit, said meter comprising:

a draw-out chassis coupled with said meter and operative to fit within a switchboard enclosure;

terminals disposed on said chassis for engaging matching terminals within said enclosure;

a display;

a meter cover operative to enclose said meter and said display within said enclosure;

a seal connected with said meter cover and operative to prevent removal of said meter cover and indicate tampering with said meter; and

a power supply coupled with said electric circuit and said meter and operative to store energy from said electric circuit and provide said energy to said meter when a power quality event occurs on said electric circuit, said power supply including:

a rectification circuit coupled with said electric circuit and operative to receive AC electric energy from said electric circuit and convert said AC electric energy to high voltage DC electric energy;

a charge control circuit coupled with said rectification circuit;

a first energy store coupled with said charge control circuit and operative to receive and store said high voltage DC electric energy from said rectification circuit at a rate controlled by said charge control circuit, said first energy store further operative to provide said stored high voltage DC electric energy to said meter when a power quality event occurs on said electric circuit; and

a switching regulator coupled with said rectification circuit and said first energy store, said switching regulator operative to receive said high voltage DC electric energy from said rectification circuit and said first energy store, said switching regulator further operative to covert said high voltage DC electric energy to low voltage DC electric energy and provide said low voltage DC electric energy to said meter.

78. The revenue meter of Claim 77, wherein said charge control circuit comprises a microprocessor.

79. The revenue meter of Claim 77, wherein said first energy store comprises at least one capacitor.

80. The revenue meter of Claim 77, wherein said charge control circuit is further operative to compare the amount of high voltage DC electric energy stored in said first energy store to a threshold and signal said meter when said stored high voltage DC electric energy crosses said threshold.

81. The revenue meter of Claim 80, wherein said meter is operative to execute a power up sequence when said charge control circuit signals that said stored DC electric energy has risen above said threshold and execute a power down sequence when said charge control circuit signals that said DC electric energy has fallen below said threshold.

82. The revenue meter of Claim 77, wherein said charge control circuit comprises:

a current limiter operative to limit inrush current to said meter; and

a bypass operative to bypass said current limiter when said at least one energy store is charged.

83. The revenue meter of Claim 77, further comprising a second energy store coupled with said rectification circuit, said charge control circuit and said switching regulator, said second energy store having a faster charging time than said first energy store and operative to provide stored high voltage DC electric energy to said switching regulator before said first energy store is charged.

84. The revenue meter of Claim 83, wherein said second energy store comprises at least one capacitor.